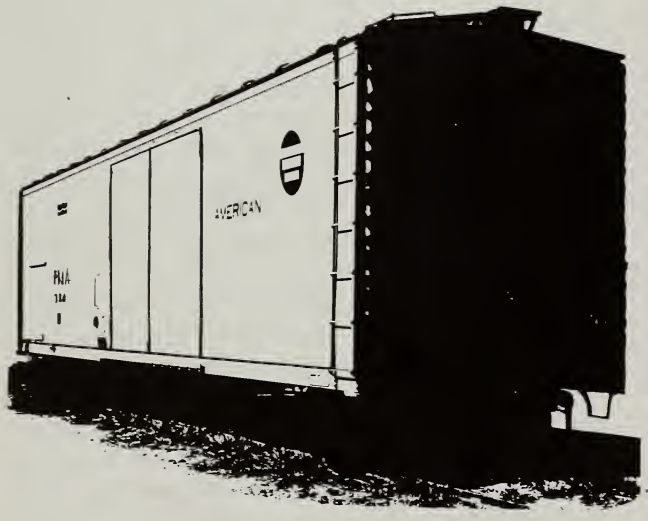
Guidelines for Pest Control in Railcars for Food Transportation



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Representatives of the food and feed industries, the railroads, and several Government agencies met to discuss the problems associated with railcars used to ship food. It was decided that a continuing cooperative effort was required to improve the situation. A Railcar Sanitation Action Committee was established to spearhead the effort, with USDA represented in the membership.

Ten Task Forces were set up to deal with specific problems identified by the Committee. One was assigned the duty to prepare guidelines for pest control in railcars and was co-chaired by the authors of this publication. The Action Committee reviewed the draft of these guidelines and approved them for publication.

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Guidelines for Pest Control in Railcars for Food Transportation

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RAILCAR FUMIGATION AND SPRAY GUIDELINES

Introduction

The Problem. Contamination of food by insects during transit in infested railcars has long been troublesome and expensive. The problem has been especially serious in milled and processed cereal products. They are highly attractive to insects and large quantities are shipped. Individual firms, trade associations, and the rail industry, on occasion, have tried to solve this problem, sometimes in cooperative efforts, without much success.

Despite the importance of contamination of food by insects in infested railcars surprisingly little research has been done, perhaps because it is so difficult to deal with. Neither has there been much published to document the nature or extent of the insect infestation problem in railcars. An excellent article on the subject has been published by Cogburn *(1973b)* of the Agricultural Research Service, United States Department of Agriculture (ARS, USDA).[1] He refers in this article to an earlier one, Cotton *et al (1940),* stating that insects infesting grain and flour were found in the cleanings from 22 of 24 cars. He also cites a report by Winburn *(1941)* that a little more than 50 percent of railcars examined in Kansas

[1]Italic year in parentheses following author(s) name refers to Literature Cited, p. 13.

in June before the wheat-harvest season were lightly infested. Cars that had been used to ship grain were examined late in July and about 92 percent were infested, often heavily.

Cogburn states that both Cotton and Winburn spoke of boxcar construction that allowed grain from previous shipments to wedge into wall and floor cracks and to become trapped in the void behind wooden wall liners. He then states that these conditions still prevail.

Cogburn did not find the packing of debris behind car liners as common as some believed. This condition existed in only 7 percent of the cars in a group of 335 cars examined. What he did find as a prevalent occurrence was an accumulation of whole-kernel grains and farinaceous material that had not been cleaned out of about three-fourths of the cars. More than one-eighth of the cars contained 5 or more quarts of infestable debris. In another part of the study nearly 100 percent of the carlots of flour arriving at Gulf ports between June and October had two or more insects on the flour. A total of 29 species were identified.

Infestations in export shipments are often blamed on railcars. Although railcars are important, they are not the only source of infestation in exported commodities (Cogburn *1973a* and *1973b*). Poor cleaning of railcars is largely responsible for the high incidence of infestation during transit. Thorough cleaning of railcars is almost impossible because of the double walls and cracks in the construction where products can lodge. Shippers frequently bypass cleaning the car to save time.

Another important publication on insect infestation in railcars was published by the Association of Operative Millers (AOM), Food Protection and Sanitation Committee *(1974)*. This publication reviews the history of the problem and gives results of studies made by the Committee in 1970 and 1972. Although the percentage of infestation did not run as high as that reported by Cogburn *(1973b)* there are several differences that could produce variable results. Primarily, the AOM study was an operational rather than a research project. Cogburn comments specifically on the difficulty of finding insects by visual inspection in the car. For example, 74 per-

cent of the cars were considered capable of supporting infestation but only 7 percent appeared to be infested by visual inspection. This figure compares closely with the 10 percent infestation reported in the 1972 AOM study. Cogburn, however, took samples of debris from cars to the laboratory for culture and examination. He found 81 percent of the samples infested and calculated a probable 60 percent rate of car infestation based on the 74 percent capable of being infested.

The AOM publication also contains a report on a study made by the Committee on Food Transportation of the Association of Food and Drug Officials of the United States (AFDOUS). The Committee reviewed 276 cars of intransit food contamination and found insects responsible for 60 percent of them. Included in the AOM publication *(1974)* is a copy of a model regulation, "Human Food: Good Transportation Practices 1972," as proposed by the Executive Board of AFDOUS.

Fumigation

No information given here is in the nature of instructions for conducting fumigations. There are many technical details that must be handled properly to insure safe and effective performance. Fumigation should be conducted only by trained and experienced persons. This publication is intended to give a better understanding of fumigation by presenting background information.

Definition of Fumigation. What is meant by fumigation? The definition approved by the Entomological Society of America is as follows: Fumigation is the act of releasing or dispersing a toxic chemical agent in such a way that it reaches the organism wholly or primarily in the gaseous state. Some persons who lack a technical background make a common mistake when they refer to the application of a liquid spray as a fumigation. An example is the application of a malathion spray as a surface treatment. Another similar error is reference to application of a pyrethrum aerosol or space spray as a fumigation. Confusing the terminology of spraying and fumigation is misleading and deceptive

because different active materials and application techniques are used, and the end objective is different for the two systems.

General Discussion. Cogburn *(1973b)* says that fumigation is expensive and often unreliable. Most of the unreliability is the result of improper procedures. An ineffective fumigation should be avoided as it is a waste of time, money, and materials. In addition, some fumigations may have been conducted merely as a token gesture in response to a purchase requirement or to give the shipper the protection of being able to say the carlot was fumigated. Several shortcuts can be taken to make it seem that a fumigation has been conducted, yet will result in very little cost. Naturally such a practice will not provide effective insect kill and will give the appearance of unreliability referred to by Cogburn. An inexperienced fumigator may not follow the right procedures and can easily make mistakes that will result in failures.

There is general concern about how to avoid the unreliability of railcar fumigation and insure effective results. Some persons believe that detailed instructions to provide standards for uniform fumigation procedures would solve the problem. This is probably true only to a limited extent. The best way to avoid poor fumigation is for sound, ethical management to take positive steps toward proper procedures. Management at times will need competent technical advice on matters relating to railcar treatments. Some firms have their own trained and experienced personnel to give recommendations, make decisions, and supervise or carry out control measures. Other firms use the services of a reliable pest-control operator for those purposes.

A set of instructions for railcar fumigation in sufficient detail to be meaningful and useful would be too long to handle here. Many factors would need to be covered. Many of them involve points upon which a choice of alternative procedures must be made. Rather lengthy discussions would be required to give enough information to serve as a basis for making sound decisions in selecting among alternate procedures. Even extensive and detailed information at the disposal of an inexperienced or careless person

could lead to procedures ineffective against insects or hazardous to people or commodities.

We believe that soon railcar fumigations will be conducted legally only by operators certified under the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act as amended in 1972.

Learning to Fumigate. One may well ask, then, how one can learn the proper procedures for fumigation. The best way, of course, is under the instruction of a competent, trained, experienced fumigator. He can demonstrate and explain the principles and judgment factors on the spot quickly and effectively.

Fumigant manufacturers or vendors will sometimes provide a technical representative to give supplemental training on the use of their product or assist on special problems. Several also have brochures describing and illustrating the proper use of their product. Some brochures deal specifically with railcar fumigation. The National Pest Control Association *(1968)* makes available to its members an excellent Technical Release entitled, "Good Practices in Vehicle Fumigation." The Department of Defense requires intransit fumigation of railcars loaded with some food purchases. The Armed Forces Pest Control Board *(1974)* has issued instructions for conducting such fumigations. Monro *(1969)* has written an excellent book on fumigation and fumigants.

Sprays

Opinions vary widely as to value of sprays in railcars, with little sound information available as to the real benefits to be obtained. The only insecticides registered for use as sprays in railcars are malathion and synergized pyrethrins. Not all formulations of those materials are appropriate for railcar spraying, so check the container label for instructions and proper use.

Aerosols, fogs, or mist sprays containing pyrethrins are sometimes used either before or after loading a car. The indications are that such sprays as usually applied have very little or no effect against the stored-product insects that are basic pests of food products. One of the sprays may be useful during the

summer where there has been night loading; outdoor insects are attracted to the lights and some enter the car. Although these insects will not infest or feed on products, they may be the cause of a customer complaint at destination. The space spray can knock down and kill these invaders, which should be cleaned up before the car leaves.

A surface spray of malathion applied to wall and floor areas of cleaned, empty railcars before paper liners are put into place can have real value. This places a deposit of malathion as a barrier between the load and any insects that may be lodged in cracks or behind the wooden car liner. The surface spray can be applied with a small low-pressure power sprayer or from a knap-sack type compressed air sprayer. Follow label instructions for amount of any dilution required and rate of application.

AN INFESTED CAR AT DESTINATION

Occasionally insects will be present in a car at destination regardless of the measures used by the shipper. Such infestation can occur in several ways. Experience and technical knowledge are required to determine whether the kind or number of insects present is significiant, whether a fumigation should be conducted, or whether the carlot should be returned to the shipper. LaBelle *(1975)* has written a short but highly pertinent and informative article about some conditions that may be involved. He discusses some considerations, decisions, and procedures in the event infestation or contamination is found at destination.

SOME FACTORS IN RAILCAR TREATMENT

A wise choice among alternative procedures is essential for obtaining safe and effective results from any treatment applied to railcars used for shipping food products. As with fumigation, providing a complete discussion of the subject, or giving instructions for procedures to follow is not feasible. We can list,

however, some major factors to consider that may be helpful. This information follows in outline form.

I. The decision to accept or reject a car received from the railroad:
   A. Is the car damaged in the roof, walls, floor, or doors? Can coopering be done at a reasonable cost?
   B. Is the car chemically contaminated from a previous load making it unfit as a food carrier?
   C. Does the car show evidence of past or present rodent infestation?
   D. Is the car tight enough to be fumigated?
   E. Can the car be cleaned up with a reasonable amount of time and effort?

II. The decision is to keep the car:
   A. Is the car clean enough to proceed with loading? If not, will it be cleaned?
   B. Should the car also receive an interior malathion surface spray? Will there be time for the spray to dry before the car must be loaded?
   C. Is the car to be fumigated?

III. The decision is to apply a malathion spray to the car. Follow these guidelines:
   A. Be sure a proper formulation is available, with a registered label covering use in railcars.
   B. Follow label recommendations for concentration to be used, rate and method of dilution, and rate of application.
   C. Be sure proper spray equipment is available and in working condition.
   D. Allow the spray to dry before placing paper liner in car before loading.

IV. The decision is to fumigate the car. Before starting, determine:
   A. If the car is located properly for safe fumigation?
   B. If the car is to be fumigated before or after loading?
   C. What fumigant will be used, for example, methyl bromide, phosphine, or other fumigants that are registered for such use. Some factors to consider are:

1. Kind of car to be fumigated: Boxcar, hopper car, or bulk-flour car.
2. If a boxcar, how tight is it and how well can it be sealed?
3. Is the fumigation for insects or rodents?
4. Is the fumigation to be done on location or in transit?
5. What kinds of commodities are in the car to be fumigated?
    a. What are the residue considerations?
    b. Is there any product present that should not be fumigated with a specific material?
    c. Does the registered fumigant label include the product to be fumigated?
    d. Is the commodity bulk-loaded?
    e. Is the commodity in bags or cartons? What is the stacking pattern in the car?

D. Determine the proper fumigant dosage and length of the fumigation period using the following conditions:
1. Consider factors listed in IV, sections B and C.
2. The temperature of the commodity and the atmosphere.
3. The relative humidity of the atmosphere and the moisture content of the product.
4. The wind velocity at time of treatment and anticipated during the fumigation period. Will the car be in a protected location or in transit?
5. If fumigating for insects, the species and life stages of the insects present.
6. Are quarantined insects involved that may be covered by special regulations?
7. The cubic content of the car.

E. Be sure the required materials, supplies, and equipment are on hand before fumigant application begins. This includes first-aid kit and gas masks with proper canisters, all in usable condition.

F. Be sure to follow safe and proper procedures in applying the fumigant.
G. Use warning placards that give all the necessary information. Attach them to the car being fumigated.
H. Notify workers in the area to stay away from the car being fumigated.
I. Notify the police, fire department, or other local authorities where this may be required or where it is appropriate.
J. Follow safe and proper aeration procedures.
K. Follow proper post-fumigation procedures. These include removal of warning placards from the fumigated car, cleanup, disposal of trash and waste materials, disposal of empty fumigant containers, and storage of material and equipment in usable condition for the next fumigation.
L. Be sure there is safe and proper storage space for fumigant, supplies, and equipment.
M. Keep a record of information about the fumigation. Do not rely on memory. A procedural checklist format is desirable, carrying entries made from the very beginning of the fumigation. For examples of checklists, see Armed Forces Pest Control Board *(1974)*.
N. When a car is fumigated in transit, notify the recipient and be sure he is fully informed about safe and proper aeration and cleanup procedures.

OTHER TREATMENTS

Salmonella and Other Microbiological Contamination

The Problem. Salmonella contamination of rendered meat byproducts was spotlighted in the late 1960's. Feeds containing these byproducts were an important source of Salmonella infection in animals. Class C railcars historically assigned to renderers and the meat byproducts industry were in bad condition

and a continuing source of Salmonella contamination.

The rendering industry, railroads, and Government regulatory agencies have cooperated to bring the problem of Salmonella contamination in meat byproducts under control. They did this by improving sanitary practices in processing plants and transportation vehicles and using better quality boxcars and hopper cars. Sometimes the rendering industry has used easily washable metal-lined truck trailers.

Government agencies responsible for sanitary handling of food and feedstuff advise that except for the meat byproducts problem, microbiological contamination of foods and feeds from boxcars and hopper cars is rarely encountered.

A digest of actions reported by members of the rendering industry to control Salmonella contamination during transport emphasizes one main point—use railcars, hopper cars, or other transportation vehicles that are in good condition and constructed so that they can be washed, sanitized, and dried before loading.

Mycotoxin-Producing Fungi

The Problem. Railroad cars with double walls (inside liners) are known to entrap trash, grain, and farinaceous materials. Such material presents a basis for growth of molds. Conditions such as damaged cars that permit water entry or excessive time in transit can create suitable conditions for mold development and occurrence of mycotoxin that could contaminate the railcar and the products therein.

Regulatory agencies advise little information is available on fungal contamination in railcars. They point out that it seems unlikely that any significant quantity of aflatoxin would remain after the cars were emptied. Spores of the fungi that elaborated the aflaxtoxin doubtless would remain in the car, however. We can conclude, therefore, that control of fungal growth in railcars is largely a matter of making sure that the cars are in good condition to prevent entrance of water and are well cleaned before use.

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